

Claims 31-45 previously canceled.

Please cancel claim 46.

REMARKS

Applicant thanks the Examiner for his time and consideration during a telephone conversation with the undersigned on Friday, June 1, 2001, during which the Examiner indicated that allowable subject matter exists at least for claims directed to stainless steel having less than about one percent (1%) Ni.

Claims 1-30 and 46 were pending in this application. Claims 1, 8, 20, 26 and 28 have been amended, claims 3, 10 and 46 have been canceled and no claims have been added. Hence, claims 1, 2, 4-9, and 11-30 are now pending. Reconsideration of the subject application as amended is respectfully requested.

Claims 1-12, 15-30 and 46 have been rejected under 35 U.S.C. § 103(a) as being unpatentable over Nagashima (EP 045088), Sivaramakrishnan (EP 0602595) and Siegele (5,607,002) in view of Langford (The Making, Shaping and Treating of Steel) or Maruhashi (4,594,114).

Claims 13 and 14 have been rejected under 35 U.S.C. § 103(a) as being unpatentable over the references cited above, taken in further view of Yamaguchi, (5,520,858) and Stauffer (5,252,134).

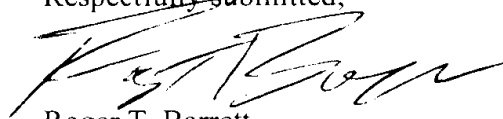
CLAIM REJECTIONS UNDER 35 U.S.C. § 103(a)

Applicant respectfully traverses the rejections for at least the reasons previously submitted in Applicant's prior filed amendments. However, to expedite prosecution, Applicant herein amends the independent claims to incorporate the limitations noted above. Applicant cancels claims 3, 10 and 46 for later filing in a continuation or related application.

CONCLUSION

In view of the foregoing, Applicants believe all claims now pending in this Application are in condition for allowance and an action to that end is urged. If the Examiner believes a telephone conference would aid in the prosecution of this case in any way, please call the undersigned at 303-571-4000.

Respectfully submitted,



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APPENDIX A

U. S. Patent Application No. 09/190,961, filed November 12, 1998  
For: LIQUID PHOSPHOROUS PRECURSOR DELIVERY APPARATUS  
Claims found in Amendment to Office Action mailed December 5, 2001  
Amendment filed with PTO June 4, 2001

A clean copy of the claims showing the most recent amendments is provided below in accordance with 37 CFR § 1.121(c). All pending claims are set forth below for convenient reference.

1. (Twice amended herein) An apparatus for use with a liquid phosphorous precursor compound comprising:  
a container comprising a liquid phosphorous precursor compound;  
a conduit; and  
an orifice disposed between the liquid container and the conduit, wherein at least one of the liquid container, the orifice, and the conduit has a surface of a stainless steel alloy having less than about one percent (1%) nickel.
2. (Previously amended) The apparatus of claim 1 wherein said stainless steel alloy has at least 15% chromium.
4. (Previously amended) The apparatus of claim 1 wherein said stainless steel alloy is selected from the group consisting of stainless steel alloy 430, stainless steel alloy 440, and stainless steel alloy 446.
5. (Previously amended) The apparatus of claim 1 wherein said liquid phosphorous precursor compound comprises TEPO.
6. (Previously amended) The apparatus of claim 1 wherein said liquid phosphorous precursor compound comprises TMP.
7. (Previously amended) The apparatus of claim 1 wherein said liquid phosphorous precursor compound comprises TEP.

8. (Twice amended herein) An apparatus for delivering a liquid phosphorous precursor compound, comprising:

a container comprising a liquid phosphorous precursor compound;  
a conduit configured to convey said liquid phosphorous precursor compound or a gaseous product of said liquid phosphorous precursor compound from the container;  
a heating surface coupled to at least one of a portion of said container and a portion of said conduit;

wherein at least one of said portion of said container and said portion of said conduit is composed of a stainless steel alloy having less than about one percent (1%) nickel.

9. (Previously amended) The apparatus of claim 8 wherein said stainless steel alloy comprises at least 15% chromium.

11. (Previously amended) The apparatus of claim 8 wherein said stainless steel alloy is selected from the group consisting of stainless steel alloy 430, stainless steel alloy 440, and stainless steel alloy 446.

12. (Previously amended) The apparatus of claim 8 further comprising a heater for heating said heating surface to a temperature of between about 160-170 degrees Celsius.

13. (Unchanged) The apparatus of claim 8 wherein said apparatus is a bubbler system for delivering gases to a chemical reaction chamber for semiconductor wafers.

14. (Unchanged) The apparatus of claim 8 wherein said apparatus is a boiler system for delivering gases to a chemical reaction chamber for semiconductor wafers.

15. (Previously amended) The apparatus of claim 8 wherein said apparatus comprises an injection system for delivering gases to a chemical reaction chamber for semiconductor wafer fabrication, and wherein said injection system includes an injection valve composed of a stainless steel alloy having less than 5 percent nickel.

16. (Previously amended) The apparatus of claim 8 wherein said portion composed of the stainless steel alloy comprises a gasket and a seal.

17. (Previously amended) The apparatus of claim 8 wherein said liquid phosphorous precursor compound comprises TEPO.

18. (Previously amended) The apparatus of claim 8 wherein said liquid phosphorous precursor compound comprises TMP.

19. (Previously amended) The apparatus of claim 8 wherein said liquid phosphorous precursor compound comprises TEP.

20. (Twice amended herein) A liquid flow injection valve for supplying TEPO, TMP or TEP to a chemical vapor deposition (CVD) chamber comprising:  
an injection orifice for connecting to a source of liquid TEPO, TMP or TEP; and  
a valve outlet for delivering a gaseous mixture generated from said liquid TEPO, TMP or TEP to said CVD chamber;  
said injection orifice including a stainless steel alloy having less than about one percent (1%) nickel.

21. (Previously amended) The valve of claim 20 wherein said stainless steel alloy has at least 15% chromium.

22. (Previously amended) The valve of claim 20 wherein said stainless steel alloy is selected from the group consisting of stainless steel alloy 430, stainless steel alloy 440, and stainless steel alloy 446.

23. (Previously amended) The valve of claim 20 further comprising a heater for heating said valve to a temperature of between about 160-170 degrees Celsius.

24. (Unchanged) The valve of claim 20 further comprising a plug in said valve composed of a polyamide.

25. (Unchanged) The valve of claim 24 wherein said polyamide is Vespel.

26. (Twice amended) A liquid injection system for a CVD chamber comprising:  
a container comprising a liquid TEPO, TMP or TEP;

an injection valve for converting said liquid TEPO, TMP or TEP into gaseous form, said injection valve having portions in contact with said liquid TEPO, TMP or TEP composed of a stainless steel alloy having less than about one percent (1%) nickel and at least 15% chromium;

a liquid TEPO, TMP or TEP injection line coupling said container to said injection valve;

a carrier gas source line coupled to said injection valve; and

an outlet line coupling said injection valve to said CVD chamber.

27. (Previously amended) The system of claim 26 wherein said stainless steel alloy is selected from the group consisting of stainless steel alloy 430, stainless steel alloy 440, and stainless steel alloy 446.

28. (Twice amended herein) A method for injecting gaseous phosphorous precursor into a chemical vapor deposition chamber, the method comprising:

providing a liquid TEPO, TMP or TEP through an injection valve including a stainless steel alloy having less than about one percent (1%) nickel;

providing a carrier gas through said valve;

creating a pressure differential in said valve; and

heating said injection valve.

29. (Previously amended) The method of claim 28 further comprising the step of heating said valve to a temperature of between about 160-170 degrees Celsius.

30. (Unchanged) The method of claim 29 wherein said valve is heated to approximately 165 degrees Celsius.